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ROYAL ONTARIO MUSEUM

Division of Zoology and Palaeontology

REPORT 1956

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note change of name
Feb 24th, 1957

ROYAL ONTARIO MUSEUM

DIVISION OF ZOOLOGY & PALAEONTOLOGY

REPORT

FOR THE YEAR ENDED JUNE 1956

Printed by the University of Toronto Press 1956

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(Part-time assistants and student-assistants are not listed)

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R. R. Hornell, *Chief Technician* (*Palaeontology*)
E. H. Taylor, *Chief Technician* (*Zoology*)
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T. M. Shortt, *Chief*
A. Reid, *Artist*

SUMMARY REMARKS

It will be noticed, by those familiar with our annual reports, that the name *Royal Ontario Museum of Zoology and Palaeontology* has been changed to *Royal Ontario Museum, Division of Zoology and Palaeontology.* This change in name has more than etymological significance; it has a fundamental organizational significance. Our Museum is now a unicameral organization with a single Director responsible to a Museum board. Within this unipartite organization are three distinct divisions of learning which we may define as follows:

Division of Art and Archaeology—the works of man
Division of Geology and Mineralogy—the earth science
Division of Zoology and Palaeontology—the life science, past and present.

Having thus employed the term "division" to be applied to the former separate museums, it became necessary to change our former use of this term as it applied to "research divisions." The term "department" was therefore introduced.

Our organizational terminology is then as follows: The Royal Ontario Museum, Division of Zoology and Palaeontology, divided into various specific study groups termed departments. Those in charge of departmental collections, or those involved in research in the departments, hold curatorial positions (assistant curator, associate curator, curator). In this report, and in subsequent reports, the curator presents the work of his department. In the absence of a curator, the report is presented by an associate or assistant curator.

It will be noted also that the name "Division of Entomology" has been changed to "Department of Invertebrate Zoology." For the past number of years we considered the study of insects of primary importance and hence this phylum of invertebrate animals was given divisional rank, while the remaining phyla were relegated to the residual category of "Invertebrates-other-than-insects." Such loose terminology leads to obvious difficulties. It is a simple matter to establish a "curator of entomology," but most difficult, if not impossible, to establish a "curator of invertebrates-other-than-insects." To avoid this most unsystematic approach, it was decided to establish a

Department of Invertebrate Zoology. By so doing we bring together all the invertebrates under a single heading and thus make it possible to divide this large subject into smaller units (representing a particular phylum or groups of phyla) with a curator in charge of each of them. At the present time our staff consists of Dr. E. M. Walker, Honorary Curator, Dr. F. A. Urquhart, Curator, and Mr. G. B. Wiggins, Assistant Curator. Eventually we may establish a curator of entomology, a curator of parasitology, and so on, all working within the one department.

A life science museum appeals to, and serves, many individuals, institutions, government departments, clubs, and other organizations. The individuals, or groups of individuals (clubs and other organizations), who have a definite interest in the fauna of a particular part of the country, are the naturalists, the hunters, and the anglers. The naturalists are well aware of the importance of a life science museum with respect to their interests. The hunters and the anglers, for the most part, are quite unaware of the importance of such an institution in so far as their interests are concerned. In an attempt to overcome this feeling of incredulity, which has been interpreted by some as contrariety, an "Anglers' Night" was held with considerable success. Our galleries were opened to the anglers. We erected special displays. We sponsored special lectures and demonstrations. Motion pictures, depicting various kinds of fishing, were shown. Music of a selected type created an atmosphere of friendly relaxation. It was indeed successful, and I do not hesitate to recommend such a procedure to my colleagues in other museums. A description of the special exhibits which were arranged for this night will be found in the report of the Department of Art and Exhibits.

I believe that most of my colleagues would agree that the two primary functions of a museum are *research* and *education*.

Research, based on a careful examination of scientific specimens, is not only time-consuming, but it is also most exacting. In order to complete a research project, many years of steady work may be required. Of basic importance to such work is the collection of specimens obtained on field expeditions and the conscientious preservation of these specimens by competent technicians. All specimens studied must be examined in minutest detail, and the findings must be carefully recorded and presented in readable form. These findings must then be published and made available to our colleagues. We are always delighted to see such work reach its final interpretation as a printed work.

Bridging the gap between a research publication directed at our colleagues and an educational publication (popular publication) for the lay reader are books dealing with our native fauna. Such books are of considerable importance to amateur and specialist alike, and we are indeed pleased that we have been able to produce a number of very fine works of this kind during the past four years. At this time I am indeed pleased to announce that *Arctic Birds of Canada* written by L. L. Snyder, Curator of the Department of Ornithology and illustrated by T. M. Shortt, Chief of the Department of Art and Exhibits, is now in the hands of the printers and will be available after February 1st, 1957. I am pleased also to inform you that a manuscript on "The Mammals of Eastern Canada" is being prepared by R. L. Peterson, Curator of the Department of Mammalogy. Mr. E. B. S. Logier, Associate Curator of the Department of Ichthyology and Herpetology, is preparing a manuscript on "The Reptiles of Eastern Canada" as a companion volume to his popular book, *Frogs, Toads and Salamanders of Eastern Canada.* Dr. E. M. Walker, Honorary Curator of the Department of Invertebrate Zoology, has completed his manuscript dealing with the families Petaluridae, Gomphidae, Aeschnidae, Cordulegastridae, and Macromiidae, which will be published as volume 2 of *The Odonata of Canada and Alaska.* It is my sincere hope that I will complete the manuscript on the "Monarch Butterfly" during this coming academic year and that it will be published not later than May 1st, 1957.

In the educational field, other than popular publications, our gallery exhibits are of fundamental importance. However, during the past year the staff of the Department of Art and Exhibits were occupied with illustrating various publications and preparing temporary exhibits, with the result that no large permanent exhibits were added to those already in existence. It is our sincere hope that within the next academic year we will be able to install, at least in part, a new gallery of reptiles, for which project plans are now being drawn up by our art staff. This can only be done, however, by increasing the Art and Exhibits staff.

Were it not for the skilled work of the technicians, the curatorial staff would find it most difficult, and in some cases impossible, to carry out their research programmes. Since the technical staff do not form a departmental unit, because they must serve all departments, a separate and distinct report does not appear in our annual report. It will be my pleasant duty to report now, and in the future, on the excellent work which has been done by our Chief Technicians, R. R. Hornell and E. H. Taylor.

During the past year, Mr. Hornell prepared, for the Department of Invertebrate Palaeontology, seventy thin sections; ten rubber moulds; and eighteen casts. Twenty-nine peel sections of reptilian jaws were prepared in connection with a study of tooth replacement being carried out by the Assistant Curator in the Department of Vertebrate Palaeontology. Of the specimens collected in the field, the following were removed from the rock matrix and assembled for study purposes, or for gallery displays: skull of a crested hydrosaur in open mount; a second hydrosaur skull of a non-crested species; an incomplete hydrosaur skull of a relatively small species. Such materials, which take many months of careful preparation, form valuable additions to our research collections and our gallery exhibits.

The work done by Mr. Taylor, Chief Technician in Zoology, is primarily concerned with the preparation of study skins for the departments of mammalogy and ornithology. Since the research collection of birds has now reached a point beyond which there can be no additional expansion owing to lack of space, more emphasis has been placed upon increasing the scope of the research collection of mammals. Mr. Taylor has reported to me as follows: "With regard to the Department of Mammalogy, there were approximately 800 accessions during the past year. One hundred and forty-two study skins were prepared, as well as 1,429 skulls and nine skeletons. In addition, seventy skins and seven skeletons were prepared for the Department of Ornithology; one skeleton for the Department of Ichthyology and Herpetology; and four skeletons for the Department of Vertebrate Palaeontology." Mr. Taylor concludes his report by stating, "[This] shows that we were able not only to cope with [our immediate preparation] but [we were] also able to prepare a back-log of approximately 600 specimens." Mr. Taylor is to be congratulated on the work which he has done during this past year.

I have not discussed the work done in each department because such information is available to you in the reports of the individual curators. I would like, however, to point out that, as is the case with every museum which I have had the pleasure of visiting during the past many years, we are beginning to feel the need for more space. Of all our departments, however, only the Department of Ornithology has grown to the point of complete spatial fulfilment. It is impossible to find extra storage space for this department at the present time. With respect to the other departments: By rearrangement of the research collection of fishes, the Curator was able to prepare for considerable expansion. By careful planning, adequate storage space is now accessible for expansion of the present research collection of mammals. Additional space will soon be available for the expansion of the research collections in the Department of Invertebrate Zoology. When sufficient funds are forthcoming, adequate space will eventually be made available for our rapidly expanding library. We are, therefore, more fortunate than many of our colleagues in other institutions. We are not, however, losing sight of the fact that within the next few years the proposed expansion of our museum will have outrun the area which is now at our disposal.

As our museum has grown to occupy its rightful place as an educational institution in our society, so the duties of the staff have increased. This is indeed a happy evolutionary trend, but obviously consideration must soon be given to the matter of increasing staff personnel so that we may more adequately fulfil the requests which are made of us. The staff of the Department of Ichthyology and Herpetology and the staff of the Department of Mammalogy are being called upon for many activities beyond their regular duties. Television and radio programmes now demand much of our attention, not only for special appearances, but also in obtaining authentic material and information for many educational programmes. Special exhibits and special open nights require the knowledge and guidance of the curators in their preparation. With so many demands upon curatorial time, research on the collections is rapidly assuming an inferior, almost neglected, position. If within the next few years assistant curators were added to our research divisions, our public relations work could be carried out with much more success.

F. A. URQUHART

DEPARTMENT OF VERTEBRATE PALAEONTOLOGY

by L. STERNBERG

The Associate Curator has almost completed the preparation of the fossil fish collected on the expedition to Maguasha, Quebec, during the summer of 1952. He also constructed the group of lungfish burrows now on display in the new fossil fish alcove. Further dinosaur skull casts are under way, some of which have been promised to the National Museum of Canada on an open exchange basis. The preparation of the skull and skeleton of a fin-backed reptile (*Edaphosaurus*) from the Permian of Texas has been started. About 200 reprints on fossil vertebrates have been received by exchange or donation and have been indexed and placed in the Department's library. Thirty-eight specimens have been catalogued.

The Assistant Curator has continued his studies on tooth replacement in reptiles. In January, 1955, several American museums were visited, and both fossil and recent materials studied. Specimens were borrowed from the American Museum of Natural History, Yale Peabody Museum, U.S. National Museum, the Paleontological Museum, University of Michigan, and the Museum of Comparative Zoology, Harvard. As a result of this study it can now be shown that a basic pattern underlies the sequence of tooth replacement in all reptiles, both fossil and recent. Originally this research was intended to apply mainly to fossil specimens, but it has become evident that modern forms not only support the deductions obtained from fossils, but, because of their better preservation, often add information not obtainable elsewhere. Taking this a step further, comparative work has been done with the piscine and amphibian ancestors of the reptiles and also with embryos of all three groups. Thus the overall picture of tooth replacement can be firmly established on both phylogenetic and ontogenetic grounds.

Tooth replacement has been known in the theropodous dinosaurs for over a century, but, because of the apparently random distribution in the jaw of teeth of various sizes, there has been no mention in the literature of an orderly replacement pattern.

A small alligator (alligators are the nearest living relatives of the dinosaurs) has been radiographed by the Assistant Curator at monthly intervals, and the photographs compared. These show that behind the superficial irregularity there is the same basic orderly pattern of tooth replacement which is present in all reptiles. A comparative study of the dentitions of the ornithopod dinosaurs permitted the construction of a phylogenetic chart tracing the evolution of the highly specialized teeth of that group.

As an extension of the comparative phylogenetic study of reptilian dentitions, numerous fossil amphibian jaws were examined. Of all the forms studied, only *Seymouria* showed the presence of resorption pits at the bases of the teeth. This characteristic is found in most reptiles, but in no known amphibians. Thus another reptilian feature has been added to the description of this in-between creature.

Several papers are being written at present, and research, especially on tooth replacement of live reptiles over a period of time, will be continued.

The Assistant Curator presented the undergraduate course on Vertebrate Palaeontology, Geological Sciences 13, University of Toronto.

Inquiries from the general public regarding certain finds that they made, and the identification of fossil materials that are brought in to the Museum, have been quite numerous. A good deal of information, along with a number of reprints, was sent to Dr. G. R. Johnson of Calgary, Alberta, to aid in the construction of a life-size dinosaur (*Struthiomimus*). This model will be used in conjunction with a number of such models permanently located in St. George's Island Park, Calgary. Specimens and photographs of fossil fish were lent to the Canadian Broadcasting Corporation for use on a television programme depicting the life of Leonardo da Vinci who was among the first to point out the remains of extinct animals found in rock. The Canadian National Railways made use of one of our copper half-tones of a dinosaur in connection with an article for their "Traffic Monthly."

Dr. and Mrs. A. Brink of the University of Wetwaterstrand, Johannesburg, South Africa, spent three days in our Department. They were visiting most of the larger museums of the United States and Canada for the purpose of learning different techniques in the preparation of fossils and some of the newer methods of display. Mr. Bruce McKorkendale of the Provincial Museum, Regina, Saskatchewan, while in the East to study preparation techniques, paid the Department a short visit.

DEPARTMENT OF MAMMALOGY

by R. L. PETERSON

The primary activities of the Department during the past year have centred around the production of a manuscript for a book dealing with the mammals of eastern Canada. Progress was made on the accumulation of a bibliography for this work, and literature records are being mapped. All the specimens from this area in our collections have been mapped.

A review of the genus *Didelphis* in Canada is in press, and work is progressing on the *Insectivora.* Work has been resumed on the genus *Tamiasciurus* with the view of producing a clarification of its distribution and variation in eastern Canada.

Studies were continued on the genus *Phenacomys.* The Curator carried out preliminary taxonomic studies and was fortunate enough to discover a most promising method for determining age on the basis of the known age material accumulated to date.

Mr. J. B. Foster (graduate student) continued field studies of the genus *Phenacomys* in western Quebec and near Churchill, Manitoba. He was able to amass considerable new data both in the field and in the laboratory. He brought an additional thirty-two living *Phenacomys* to our laboratory colony and carried out further life history studies on these captive animals. Mr. C. S. Churcher (graduate student, working under the direction of the Curator) proceeded with his taxonomic studies of the genus *Vulpes.* The Curator also carried out preliminary research on the mammal portion of a joint study of the recent changes in the fauna of Ontario.

The Curator conducted the graduate course in Mammalogy (Zoology 24) as well as the mammal portion of the undergraduate course Zoology 25 for the students of the University of Toronto. He also served on various graduate committees of students in the Department of Zoology.

During the year a total of 815 specimens was added to our collections; 319 by staff collecting, 495 by donation, and one by exchange. Among the donations were 379 laboratory-reared *Dicrostonyx* of known age, kindly provided by Mr. D. S. Smith of the Department of Zoology, University of Toronto. These have been selected to show development in all age classes. Mr. Foster's collecting near Churchill accounted for 277 specimens, 174 of the genus *Phenacomys.*

Preparation of specimens proceeded at a satisfactory rate with the assistance of student employees during the summer and holidays. A total of 1,580 specimens, including 1,429 skulls, 9 skeletons, and 142 skins, was prepared.

Registration of specimens was limited to approximately 500 specimens, with the Research Assistant concentrating on other phases of work, particularly the bibliography for the mammals of eastern Canada .

Facilities were provided for Mr. R. Standfield of the Research Division, Ontario Department of Lands and Forests, to conduct taxonomic studies of the wolves of eastern North America. Specimens from several other institutions were brought together with those of this Department and made available for his use.

The Curator attended, and presented a paper at, the annual meeting of the American Society of Mammalogists, held at the University of Southern California, Los Angeles, where he was re-elected as Recording Secretary. He also attended the North American Wildlife Conference in New Orleans, Louisiana. The nationwide CBC-University Television Series "Exploring Minds" featured the Curator in a series of three programmes March 25th to April 8th, who presented considerations of the beaver, the moose, and Canadian foxes. He also participated in other radio and television programmes dealing with mammal subjects.

DEPARTMENT OF ORNITHOLOGY

by L. L. SNYDER

Specimens added to the research collection during the year, most of them donations, totalled 179. Noteworthy items are as follows: A Ruff (*Philomachus pugnax*) from Fort Severn, Ontario, presented by Mr. Harry Lumsden; a Passenger Pigeon from Norfolk County, Ontario, by Mr. Russell M. Browne through the offices of Mr. Paul Hahn; a specimen of the Wild Turkey originating from Strathroy, Ontario, by Mr. Montague Smith; an Ontario specimen of Wilson's Petrel from Welland County, by Mr. Glenn Meyers; a Leach's Petrel from Leeds County, by Dr. G. M. Stirett; the only known Ontario specimen of the European Widgeon, presented by the Long Point Company through the offices of Mr. Frank Kortright; an Ivory Gull from Fort Albany, by Mr. H. A. Hennessey; a Laughing Gull from Winisk, by the Ontario Department of Lands and Forests. It is particularly gratifying to report such a large number of individual specimens of historic and scientific importance having reached the safe-keeping of the Museum.

Cataloguing of skin, skeletal, and nest-and-egg material, largely from an accumulated backlog, has progressed this year consequent to the employment of an experienced assistant, Mrs. Kathryn Cody. A total of 1,643 items and lots have been catalogued and incorporated into the collections. The Research Assistant reorganized the collections in the bird room from penguins to hawks and made similar adjustment with the nest-and-egg collections from penguins to doves.

In the field of research the Curator has proceeded with his plan to produce a technical reference book on Ontario birds. The list of authentically recorded species has been categorized according to status, and a form of treatment resolved for each of the six component groups. A first draft of the text covers *Gaviiformes*, *Podicipitiformes*, *Procellariiformes*, and *Pelecaniformes*. The work is intended to present information essentially based on Ontario specimens and studies, and should indicate desiderata as well as summarizing our present knowledge.

Related to the above, mention should be made of the Department's bibliography of Ontario birds by species commenced many years ago by the Research Assistant. Some 986 entries cards have been added during the year. Mrs. Margaret Mitchell, a valued volunteer, has carried out considerable reading of publications of the early French explorers, and some information on Ontario birds has accrued. Also the master maps on distribution have been approximately brought up to date with the assistance of Mrs. Cody. All these long-term projects are essential to the Department's researches on Ontario birds.

Additional contributions have been made by the staff in the general field of ornithology. The Curator has prepared a paper on "Changes in Ontario's Avifauna" as a part of a more comprehensive faunal report with Museum colleagues. The Research Assistant continued as regional editor for Audubon Field Notes, a post from which he has but recently resigned.

Assistance to researchers in other institutions is a continuing responsibility. During the year 52 + 102 specimens have been loaned to Cornell University; 21 to the Carnegie Museum; 51 to the University of Connecticut; and 10 to the Ontario Department of Lands and Forests. The facilities of the bird room have been made available to the following ornithologists: Mr. David Fowle, Mr. Harry Lumsden, Mrs. Doris H. Speirs, and Mr. David West. Information concerning the geographic location of place names was forwarded to Mr. W. L. McAtee of Chapel Hill, North Carolina; specimen data were forwarded to Mr. F. Bradshaw of Vancouver, B.C.; and information on the recognition of sex in *Junco hyemalis* was forwarded to Mr. R. J. Rutter of Huntsville, Ontario. Specimens of *Sitta carolinensis* were critically examined for the Saskatchewan Museum at their request.

The ornithological portion of the University Course, Zoology 25, was presented by the Curator who also attended the oral examinations of a graduate student.

In addition to University lectures, the staff has given a number of papers or talks to non-university groups, 15 by the Research Assistant, and 10 by the Curator. Local and international organizations in their field of interest have been supported by the staff as usual. The Curator attended the 73rd Stated Meeting of the American Ornithologists' Union in Boston and as a Fellow took part in the business of that organization. A large volume of inquiry by telephone and by letter, concerning birds, has received regular attention.

DEPARTMENT OF ICHTHYOLOGY AND HERPETOLOGY

by W. B. SCOTT

During every fiscal year one or two features or accomplishments usually stand out above others because of their unusual nature or importance. Two such features this year are, first, the relatively large amount of material added to the permanent collection, and secondly, the collection of freshwater fishes taken in the provinces of British Columbia, Alberta, Saskatchewan, and Manitoba during the summer of 1955.

The permanent collection of fishes was enlarged by 1,325 lots (13,625 specimens), a much greater increase than has ever been achieved previously in a comparable period. These additions to the collections were represented by specimens from every province in Canada, and in addition, from the Northwest Territories, Atlantic Ocean, Greenland, and eight states of the United States. Mr. James Woodford, part-time assistant, was responsible for the processing and cataloguing of this material.

The most notable addition to the collection made during the year was approximately 4,400 fishes collected in western Canada (British Columbia, Alberta, Saskatchewan, and Manitoba) during the summer of 1955. In addition to the value of the material in systematic studies, three species were added to the known fauna of Saskatchewan. The collection was made by the Curator as a necessary part of a current study on the freshwater fish fauna of Canada. The Curator welcomes the opportunity to thank the personnel of the universities and provincial departments in the four provinces who gave so generously of their time to assist in the work.

Specimens for the research collection have been donated by institutions and organizations, such as University of Michigan, University of Saskatoon, McGill University, Fisheries Research Board of Canada, Ontario Department of Lands and Forests, and Ontario Department of Planning and Development.

The service of identifying fishes for other organizations and institutions continued. Although this work often requires considerable curatorial time, because too few Canadian institutions offer such service, nevertheless the

Museum is compensated by many valuable additions to its research collection. Some of the institutions and organizations to whom this service was extended were: The Fisheries Research Board of Canada, Department of Natural Resources of the Province of Saskatchewan, University of Saskatoon, McGill University, Ontario Council of Commercial Fisheries, and the departments of Lands and Forests and Planning and Development of the Province of Ontario.

Other institutions have made use of the research collection and laboratory facilities: Mr. R. Dorrett, Saskatchewan Museum, Regina, Saskatchewan, and Mr. Sherman Bleakney, National Museum of Canada, Ottawa, Ontario, visited the Department during the year. Laboratory space and material was made available to personnel of the Fisheries Research Board of Canada for one half day per week for a four-month period in connection with lamprey investigations. Mr. G. H. Lawler, Fisheries Research Board of Canada, was provided with working space during a three-week period for the pursuance of his research on whitefish populations. Scientific specimens for study have been loaned or given to the following individuals and institutions: Professor Bernard Martof, University of Georgia; Dr. V. D. Vladykov, Department of Fisheries, Quebec; Dr. D. M. Cohen and Dr. N. J. Wilimousky, Natural History Museum, Stanford University; Dr. R. M. Bailey, Museum of Zoology, University of Michigan; Mr. Vianney Legendre, Quebec Biological Bureau, Montreal.

Requests for information concerning fish and fisheries are many and varied and have originated from such organizations as the Canadian Broadcasting Corporation, (TV) Special Effects Department, advertising companies, and newspapers, as well as from innumerable private individuals.

Other activities in the interests of public service include participation in four radio programmes and one television programme devoted to fishing and outdoor activities and a lecture to a fish and game club in the Toronto region.

The Associate Curator has commenced work on a handbook of the reptiles of eastern Canada, a companion volume to the *Frogs, Toads and Salamanders of Eastern Canada* which was published in 1953 by Clarke, Irwin Co.

The *Check-List of the Amphibians and Reptiles of Canada and Alaska,* completed last year by the Associate Curator assisted by Mr. G. C. Toner, was published this year as Number 41 of our Contribution Series.

The second edition of the *Freshwater Fishes of Eastern Canada,* by the Curator, first published in 1954, was published this year when the supply of the first edition was exhausted. In addition, two popular-style publications, one on the smelt, and one on the Wendigo, were published.

A wall chart displaying twenty-one full-colour illustrations of Ontario sport fishes from paintings by the Associate Curator, was printed during the year. The need for a chart of this type has been recognized for many years, particularly in a province so well provided with game fishes as Ontario.

The Curator served on graduate committees for the Department of Zoology, University of Toronto; as a Director of the Ontario Council of Commercial Fisheries; on the Board of Governors of the American Society of Ichthyology and Herpetology; and on a standing committee of the American Fisheries Society. He also attended the following meetings: Canadian Committee for Freshwater Fishery Research, Ottawa; The Ontario Council of Commercial Fisheries, Toronto; the American Society of Ichthyologists and Herpetologists, San Francisco.

DEPARTMENT OF INVERTEBRATE PALAEONTOLOGY

by M. A. FRITZ

During the year 595 specimens were acquired through staff collection and 92 by exchange with Professor V. J. Okulitch, University of British Columbia. Among the more significant donations received were: an unestimated number of specimens of the widely distributed foraminiferal species *Endothyra baileyi* (Hall) from the Salem limestone of Indiana, two Devonian corals from southwestern Ontario, one unique Ordovician stromatoporoid from Manitoba, and two Tertiary insects from British Columbia. Our donors to whom we are indebted for the above are: Professor T. G. Perry, Indiana University; Mr. L. Lebbink, Amherstburg, Ontario; Dr. A. Kingscote, Ontario Veterinary College, Guelph; and Dr. E. M. Walker, Department of Invertebrate Zoology, Royal Ontario Museum. We are also indebted to Professor P. S. Warren, University of Alberta, for the loan of his extensive suite of Devonian index fossils from western Canada. This valuable assemblage stimulated interest in the succession of invertebrate faunas from the western oil fields.

Specimens catalogued numbered 273.

Field work carried on in the summer of 1955 was made possible through a grant from the Advisory Committee of Scientific Research of the University of Toronto. Ordovician strata were examined at Eganville, Paquette Rapids, and Deux Rivières, all of which lie within the same structural belt as the islands in Lake Nipissing which were visited during the previous field season. Proceeding northward, further Ordovician (as well as Silurian strata) were examined at Haileybury and New Liskeard on Lake Timiskaming. Data essential for a detailed study of the above mentioned "outliers" were collected, including an assemblage of the characteristic fossils.

Research completed since July, 1955, includes a study of:

1. Bryozoa of the Ottawa formation of the Ottawa–St. Lawrence Lowland. The report, which will constitute a Bulletin of the Geological Survey of Canada (now in hands of the Editor in Ottawa) is one of a series of planned reference texts on the Palaeontology of the Palaeozoic strata of the area under consideration. The region is described, the formation discussed, the fauna

analysed, the suggested correlation indicated, and new forms described, along with comments on associated bryozoan species. Of the 64 species and varieties recognized, 34 are new to science. Dr. T. E. Bolton, Geological Survey of Canada, assisted in the final preparation of the manuscript for publication.

2. Stromatoporoidea of the Upper Abitibi River formation. Stromatoporoids are an extinct group of organisms of doubtful affinities believed to be related to the *Hydrozoa.* Few palaeontologists have undertaken comprehensive studies of these stratigraphically important fossils. In North America the late Professor W. A. Parks and the presently active Professor J. J. Galloway of Indiana, are the best known.

The material forming the basis of this study was collected by the Curator and assistants from the Upper Abitibi River limestone (Middle Devonian) at Coral Rapids in the James Bay Lowland during the years 1950–52. The "Parks Collection of Stromatoporoid types" (microscopic slides and hand specimens), located in the Royal Ontario Museum, provided extremely valuable reference material for the interpretation of the Coral Rapids fauna which, up to the present, had not been described. As a result of the investigation, 14 species, representative of 7 genera, were identified; 12 species are new to science. All species are described macroscopically and microscopically, characteristic thin sections being illustrated. R. R. Waines, graduate student at the University of Toronto, is co-author with the Curator in the paper which will be published in the *Proceedings of the Geological Association of Canada,* Volume VIII, 1956.

In addition to the above scientific studies the popular booklet *Story of Ancient Life* was revised and published by the University of Toronto Press, January, 1956. The illustrations for this booklet were prepared by Mr. A. Reid, Department of Art and Exhibits, Division of Zoology and Palaeontology, Royal Ontario Museum.

The Curator edited and produced Special Paper No. 1 of the Geological Association of Canada entitled *Devonian Faunas of Western Canada* (published, May, 1956). She also participated in the work of the "Committee on Scholarships of the International Federation of University Women" upon which Committee she is serving for five years (1955–59). Scientific meetings attended were: the Royal Society of Canada and the Geological Association of Canada (summer, 1955).

The Department assisted a number of geologists, persons of other categories, and institutions as follows:

Professor H. S. Armstrong, McMaster University, Hamilton, Ontario—a collection of fossils from the Dundas formation of Toronto for use in his classes (exchange to be received later).

Professor D. M. Baird, Memorial University, St. John's, Newfoundland—Palaeozoic fossils from Ontario to form a nucleus for teaching morphological palaeontology (Newfoundland material promised in exchange).

Dr. J. Deunff, Université de Rennes, Rennes, France—Devonian corals to assist in his special research.

Dr. H. Frebold, Geological Survey of Canada, Ottawa—casts and moulds of Carboniferous *Ceratiocaris pusillus* (Matthew) from the "Matthew Collection of Arthropod types."

Dr. Helmut Flügel, Universität Graz, Geologisches Institut, Austria—reprints of stromatoporoid papers of the late Professor Parks required for current research (fossils from Graz to be sent in exchange).

John Hall, lecturer in drawing and design, School of Architecture, University of Toronto—a collection of miscellaneous fossils to be used in classes as examples of "design."

Dr. Gilbert O. Raasch, Canadian Stratigraphic Service, Calgary—identification of bryozoa submitted for age determination to aid in field studies.

Dr. Grace Stewart, Calgary, Alberta—bibliography dealing with Ontario Devonian.

Dr. Ronald Tripp, Glasgow, Scotland—furnished casts and moulds of *Acrolichas cucullus ottawaensis* Foerste and *Hemiarges paulianus* (Clark) from "types" in the Department.

Mr. and Mrs. E. P. Wright of Detroit visited the Department to study fossils from the Currie and Kearney collections from the Thedford area, southwestern Ontario, in connection with an investigation they are carrying on in collaboration with the Department of Geology at the University of Michigan, Ann Arbor, Michigan.

For the *Daily Nugget*, North Bay—an article on the geology of the Manitou Islands, Lake Nipissing, based upon fossils submitted for interpretation.

In addition to the above, attention has been given to the usual volume of professional letters received during the year. Department members also furnished information from time to time to persons who brought fossils to the Museum for identification.

Special exhibits included: Fossil Nautilus; Twin Trilobites; New Fossil Clam; Fossil Sea Lily.

DEPARTMENT OF INVERTEBRATE ZOOLOGY

by G. B. WIGGINS

Most of the Curator's research time was devoted to his studies of the movements of the monarch butterfly. This work is now nearing completion and a book-sized publication will be prepared during the next academic year setting forth the results of this investigation. No further progress was made with the manuscript for *The Orthoptera of Eastern Canada*, but a number of illustrations were prepared and life photographs taken. In this connection our sincere thanks is extended to our colleague, Dr. Ralph Bird of the Department of Agriculture, Brandon, Manitoba, for a set of coloured photographs of various species of grasshoppers.

The Honorary Curator has now covered somewhat more than half of the Anisoptera as a continuation of his work on *The Odonata of Canada and Alaska*. Because of the large number of anisopterous species to be included, it has been decided to publish this portion of the work in two volumes instead of one, making three volumes in all. Work on the families Petaluridae, Gomphidae, Aeshnidae, Cordulegastridae, and Macromiidae has been completed, and the manuscript is now being prepared for publication as Volume Two. A separate paper was also finished in which evidence from genital structure was used to gain a clearer understanding of the affinities of the North American species of *Gomphus*.

Most of the Assistant Curator's work on Trichoptera was devoted to a systematic study of the Phryganeidae of the world. Encouraging progress has been made in obtaining necessary material through exchange and loan from workers in Japan, Russia, and many European countries. Much material has been received also from various collections in North America. Specimens of almost all of the known phryganeid species have been examined and representatives of most of these have been added to the collection. The cooperation and goodwill shown by workers the world over has been of first importance in the advance of these studies. One paper was completed in which evidence was presented concerning the occurrence in North America of the Kitagamiidae, a family of caddisflies not previously known on this continent. Studies on the genera *Banksiola* and *Oligotricha* were well advanced. Material was brought together, through exchange and from unidentified specimens in the collection, for a study of the world species of the molannidae. Some progress was made in finding diagnostic characters for the North American females of *Molanna.* Numbers of phryganeid, limnephilid, and molannid larvae were reared. Material of the limnephilid genus *Neophylax* was obtained, by field collection and by rearing, for a study of the North American species of *Neophylax* which is being carried out as time permits. Extended visits were made to examine the collections of the Illinois Natural History Survey and the Museum of Comparative Zoology.

We acknowledge with thanks the donation of a collection of Trichoptera from Dr. G. E. Ball of the University of Alberta, of Odonata from Professor G. H. Bick of Tulane University, and of Odonata and Trichoptera from Mr. D. M. Wood of the University of Toronto. Mr. V. Crichton of the Ontario Department of Lands and Forests has also made a number of valuable additions to the collection of Trichoptera. Specimens have been loaned by many persons and institutions and to all of these we express appreciation. The Department is again indebted to the Honorary Curator, Dr. Walker, for many books, as well as long series of various entomological periodicals, which he presented to the library.

Two banks of steel shelves, which more than double the previous storage space, have been installed for storage of alcoholic material.

Activity in the section of non-hexapod invertebrates was confined to field work on freshwater jellyfish. A paper outlining these observations and summarizing the Ontario records was prepared by the Assistant Curator in cooperation with R. E. Whitfield and F. A. Walden, biologists with the Ontario Department of Lands and Forests.

The Curator presented an undergraduate course (25) and a graduate course (22) on systematic entomology to the students in the University of Toronto.

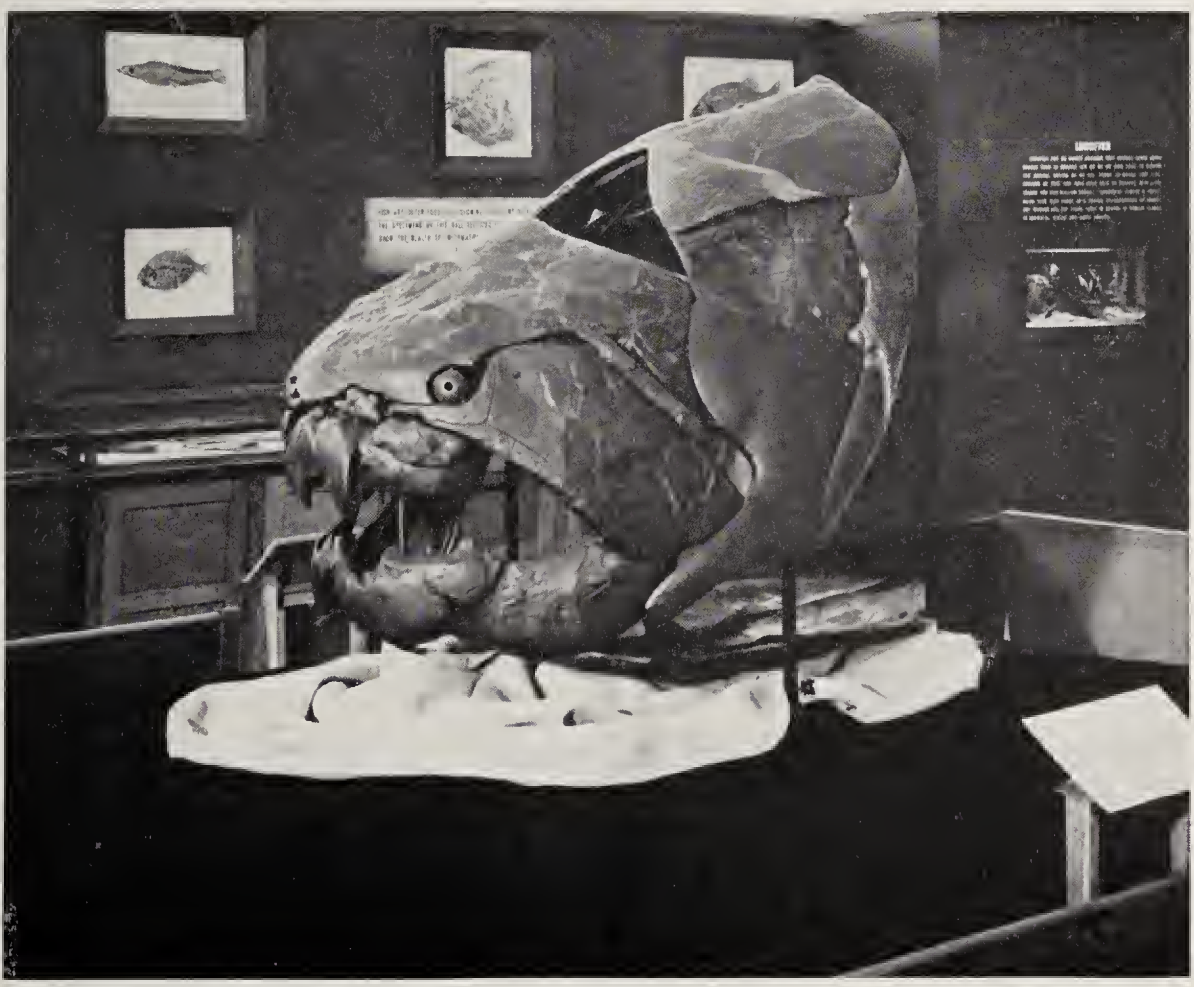
DEPARTMENT OF ART AND EXHIBITS

by T. M. SHORTT

The preparation of illustrations for publications of the Division's research departments claimed the greater part of our time during the 1955–56 season. As a result no major gallery project was undertaken.

Illustrations

A series of seventy-two black-and-white scratchboard drawings was made for "Arctic Birds of Canada," a forthcoming book written by the Curator of Ornithology. These drawings depict more than one hundred and twenty-five plumages of the birds that occur in the Canadian Arctic, a part of Canada in which great interest has recently been aroused. They have been designed



A cast of the head of Dinichthys, a thirty-foot armoured fish of Devonian seas especially for the resident of, or visitor to, the Arctic and show many species in plumages peculiar to their Arctic sojourn. Field identification of many of these plumages is not always possible through reference to presently available field books. In addition, seventy-four maps detailing the ranges of birds in the Canadian Arctic were prepared.

Eleven drawings, with overlays for two-colour reproduction, were done for the revised edition of *Story of Ancient Life* written by the Curator of the Department of Invertebrate Palaeontology.

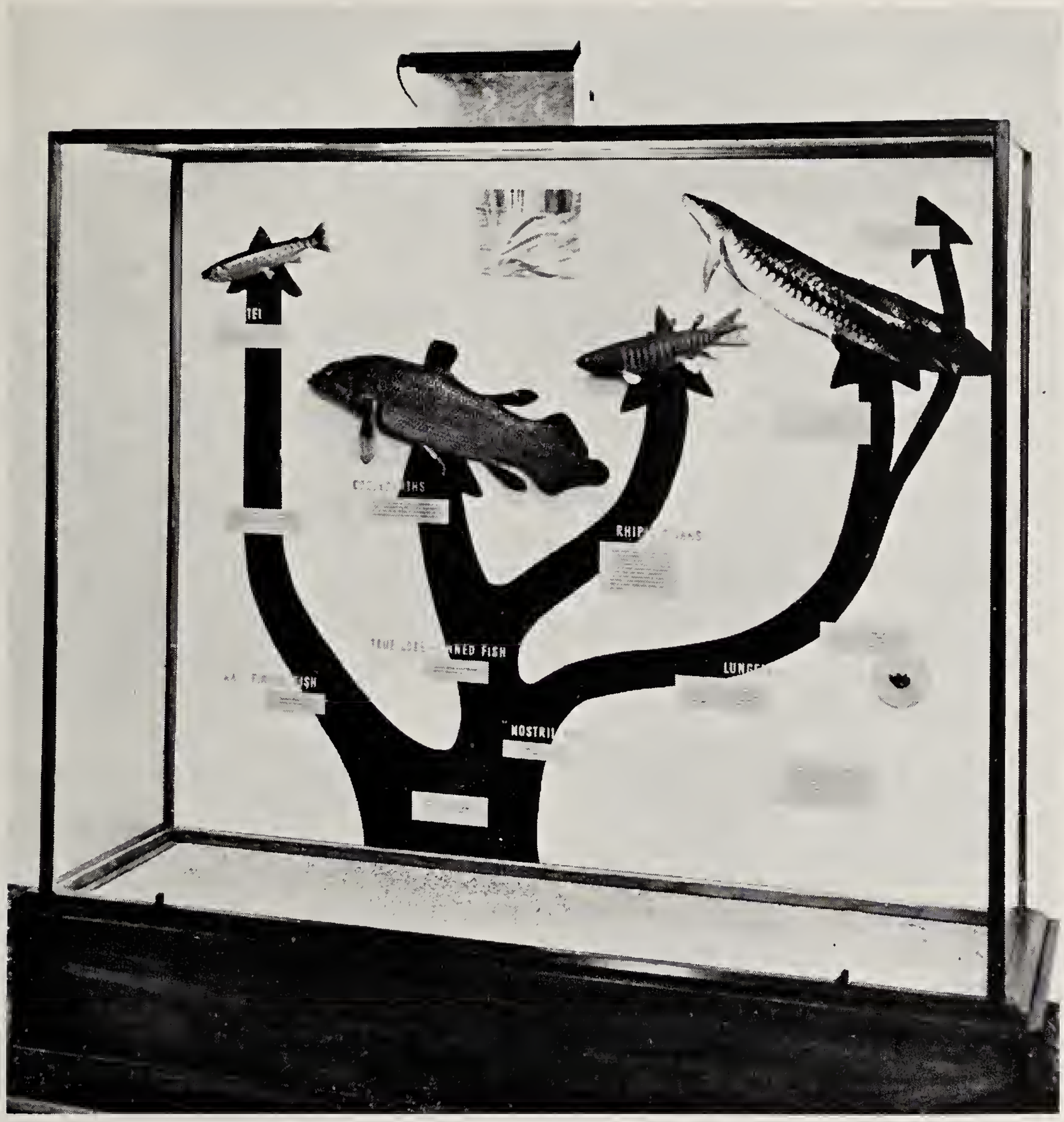
Several drawings of anatomical details of dragonflies were made for Dr. E. M. Walker and two drawings for Mr. G. Edmund. These are to appear in scientific publications.

Gallery Exhibits

Several special exhibitions were designed and installed for "Anglers' Night." These included: A comprehensive display of fishing gear (primitive and modern); examples of nets, spear, hooks, and traps used by aboriginal peoples were loaned for the occasion by the Division of Art and Archaeology; and a fine selection of the best of modern gear was loaned by the John Inglis Co. A display featuring bait-minnows and demonstrating, through maps and living examples in aquaria, the world-wide distribution of the family. An exhibit of trout-flies and fly-tying equipment to support a demonstration of fly-tying. An exhibit on the hybridization of lake and speckled trouts and the characteristics of the much-publicized and controversial hybrid—the splake or wendigo trout. A display of books which included the first book on angling printed in English. Many fine volumes were loaned by Toronto publishing houses for this display.

An exhibition of early fishes was arranged in the vertebrate palaeontology gallery. This was produced in more permanent form than the others and will remain on display. The central feature of this alcove is the cast of a giant *Dinichthys* skull obtained through an exchange with the Cleveland Museum of Natural History. Natural fossil casts of the burrows made by lungfish that lived when the Permian formation was being deposited are displayed beside an aquarium containing a living African lungfish. Other exhibits are built around some of the splendid examples of fossil fishes in the Museum's collection. These are used to show, in conjunction with models, casts, and drawings, stages in the evolution of fishes from the primitive jawless kinds to those that are much like the fishes we know today.

Contributions were made to three special exhibitions in the Division of Art and Archaeology. For the "Ivory and Bone" exhibition a small introductory exhibit was prepared and installed in the Currelly Gallery. This por-



An exhibit in the form of a family tree tracing the major events in the long lineage of modern fishes

trayed "The Raw Materials"—the skulls, bones, and tusks of wild animals which have been used by man in the fashioning of implements, weapons, and art objects. Specimens and paintings were loaned as supplementary exhibits for the map show "Across the Rockies" and for the loan exhibition on Australian Aborigines.

A cast has been made in latex of the eleven-foot Anaconda received last year.

Among the living animals shown in the aquarium during the past year have been alligator, piranha, sea horse, bowfin, smelt, stickleback, emerald shiner, bluegill, pumpkinseed, large mouth black bass, yellow bullhead, and yellow perch.

LIBRARY REPORT

by E. R. McCLURE

During the year, 2,461 publications were received and catalogued, bringing the total holdings of the library to 87,614.

Among the new acquisitions are the *F.A.O.* (United Nations) *Fisheries Bulletin, Birds of the Soviet Union*, and a large number of translations of Russian ichthyological papers. The last two items especially are valuable in that they provide current information on areas that have not been well represented in the library's recent zoological literature.

The use of inter-library loan facilities has increased both in borrowing and in lending books, and loans were made with McGill University, the Museum of Comparative Zoology, the Geological Survey of Canada, the Imperial Oil Company, Calgary, and the Canadian Stratigraphic Service.

Several new exchanges were established, and Kyushu University, Imperial University, Tokyo, and the Science Council of Japan kindly supplied issues of their publications needed to complete our series.

Two noteworthy donations were received: an extensive collection of entomological periodicals and books donated by Dr. E. M. Walker, Toronto, and a five-volume work, *Records of Birds Bred in Captivity*, donated by the author, Mr. Arthur A. Prestwich, England. Many donations were received from the Department of Mines and are much appreciated.

STAFF PUBLICATIONS

BAILLIE, J. L. Hawks and owls (Crumlin Sportsman's Guide, Spring, 1955, opposite p. 41).

——— An introduction to the study of birds (A series of ten lectures given to Evening Tutorial Classes, University of Toronto Extension, mimeographed, 104 pages).

——— Worth noting (Bulletin, Federation of Ontario Naturalists, no. 68, Spring, 1955, pp. 33–35).

——— Fifty-fifth Christmas bird count—Toronto, Ont. (Audubon Field Notes, vol. 9, no. 2, April, 1955, p. 71).

——— Winter season—Ontario-western New York region. (Audubon Field Notes, vol. 9, no. 3, June, 1955, pp. 254–256).

——— Worth noting (Bulletin, Federation of Ontario Naturalists, no. 69, Summer, 1955, pp. 29–32).

——— Spring season—Ontario-western New York Region (Audubon Field Notes, vol. 9, no. 4, Aug., 1955, pp. 328–329).

——— The golden eagle nesting in the Gaspe peninsula, Quebec (Canadian Field-Naturalist, vol. 69, no. 1, Jan.–Mar., 1955, pp. 13–14).

——— Nesting season—Ontario-western New York region (Audubon Field Notes, vol. 9, no. 5, Oct., 1955, pp. 375–377).

——— Worth noting (Bulletin, Federation of Ontario Naturalists, no. 70, Fall, 1955, pp. 30–32).

——— Christmas bird census—1954—Toronto, Ont. (Canadian Field-Naturalist, vol. 69, no. 2, Apr.–Jun., 1955, pp. 54–55).

——— How the Federation was formed (Bulletin, Federation of Ontario Naturalists, no. 71, Feb., 1956, pp. 2–4).

——— Brodie Club (Bulletin, Federation of Ontario Naturalists, no. 71, Feb., 1956, p. 43).

——— Representation to the fish and game committee of the Ontario Legislature [on hawks and owls] (Audubon Society of Canada, mimeographed, 3 pages).

DOWNING, S. C. The grizzly bear (Canadian Nature, vol. 18, no. 1, 1956, pp. 8–9).

LOGIER, E. B. S. The sport fishes of Ontario [Wall chart in colour] (1955).

LOGIER, E. B. S. and G. C. TONER. Check-list of the amphibians and reptiles of Canada and Alaska (Contribution no. 41, Royal Ontario Museum, Division of Zoology and Palaeontology, 1955, Pp. 88).

PETERSON, R. L. *Phenacomys* eaten by speckled trout (Journal of Mammalogy, vol. 37, no. 1, 1956, p. 121).

Scott, W. B. Freshwater fishes of eastern Canada (University of Toronto Press, 1955, Pp. 128, 2nd edition).

——— The smelt in Ontario (Royal Ontario Museum, Division of Zoology and Palaeontology, 1956, Pp. 7).

——— Wendigo, the hybrid trout (Royal Ontario Museum, Division of Zoology and Palaeontology, 1956, Pp. 7).

Snyder, L. L. A brief on the local museum (Ontario Historical Society, News Letter no. 18, Dec., 1955).

——— Ross's Goose in Ontario (Canadian Field-Naturalist, vol. 69, no. 1, Jan.–Mar., 1955, pp. 26–27).